ME 750I - Advanced Design of HVAC Systems

Fall 2001

Catalog Data:

ME 750I Advanced Design of HVAC Systems Credits 3. Theory, analysis, and design of air-conditioning systems based on thermodynamics, and heat transfer fundamentals. Emphasis is on design procedures for space air- conditioning, related equipment sizing, and system integration. Prerequisites: ME 621, 622 and ME 502.

Textbook: F. C. McQuiston and J. D. Parker, <u>Heating, Ventilating, and Air-Conditioning: Analysis and Design</u>, 5th ed., John Wiley & Sons, Inc., 2000. (ISBN: 0-471-35098-2)

Instructor/Coordinator: Dr. T. S. Ravigururajan, Rm. EB 101Q, 978-6370. (ravi@me.twsu.edu)

References:

- TRANE Air Conditioning Manual, McGill/Jensen, Inc., St. Paul, MN, 1994.
- ASHRAE Fundamentals Handbook, latest edition.

Topics (1 class = 75 min.):

420

1. Introduction to air-conditioning and refrigeration systems. (1 class)

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2. Moist air properties, psychrometric processes, and analysis of space

air-conditioning for design and off-design conditions. (4)

9/0, 9/1

3. Environmental comfort and health requirements for building air quality.(2)

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4. Heat transmission in building structures. (2)

19/1 //

5. Cooling load analysis. (4)

- 6. Duct design (4)
- 8. Room air distribution (2) 1/2 c, 11/2 c
- 9. Cooling coils and fans (4) 1/5 11/5 11/6 11/4

10. Examinations (3)

Computer Usage:

Students are expected to use computer facilities available to them for load calculations and word processing in their homework and design projects. Any available HVAC program should be used in solving problems and the students will use the package in their design project and in project analysis, if there is any.

Estimated ABET Category Content:

Engineering Science: 2 credits or 67 %

Engineering Design: 1 credit or 33 %

Grading:

Tests (15% each) x 3 45% (Sept. 24, Oct. 22, Nov. 19, 2001)

Minutes of meetings: 10%

Projects (15 + 30) 45% (Due Oct. 22, and Dec. 10, 2001)

90% or greater - A

80% or greater - B

65% or greater - C

55% or greater - D

Less than 55% - F

Office Hours: As posted; e-mail: Ravi@me.twsu.edu; Tel: 978-6370

PROJECT WORK for ME 744- Design of HVAC Systems

The class will be divided into several groups with 3 members each. The group will select a project of its choice {Ex. A multi-storied college building such as Wallace Hall, a high school building (pick a real school), or a proposed manufacturing plant (specify your own plant), an aircraft, submarine, etc.}. The bids to design and install a modern air-conditioning system on a turn-key basis should be prepared and submitted with the following information:

[The commercial program, if available, should be used]

- a. Complete list of appropriate assumptions
- b. Cooling loads for various regions. These must be calculated at least for 3 different time periods and during different time of a given day.
- c. Design appropriate duct system to provide necessary air with appropriate filtering and grill systems.
- d. List of selected machinery, including blowers, chillers, ducts, and other equipment.
- e. Provide performance curves for the complete system along with anticipated performance variation due to change in number of personnel, outdoor temperature, and other important parameters.
 - f. Provide a breakdown of first costs for the entire system and operating costs.

Graduate students are expected to do their projects independently

HOMEWORK:

Due to the nature of the class schedule and the course structure, home work problems will be assigned regularly. The students are expected to solve the problems and bring them to every test. The students will be asked to submit specific homework problem(s) at the time of the test. Please note many problems in this course are openended, and, therefore, you may have different solutions to the same problem.